What is claimed is:

1. A device for manipulating non-magnetic particles dispersed inside a fluid comprising:

a) a fluid holding chamber comprising an inner and outer surface;

b) a fluid in contact with the inner surface of the fluid holding chamber, said fluid containing a dispersion of magnetic particles and a dispersion of non-magnetic particles; and

c) at least two sources of magnetic fields positioned in close proximity to, or inside of, the fluid holding chamber which produce a changeable pattern of magnetic field minima and maxima regions thereby causing the non-magnetic particles in the fluid to be transported towards the magnetic field minima regions by magnetic force.

2. The device of claim 1 further comprising an array of different molecules attached to the inner surface of the fluid holding chamber.

3. The device of claim 1 further comprising an array of different nanoparticles or microparticles attached to the inner surface of the fluid holding chamber.

4. The device of claim 1 further comprising a sensor attached to the inner surface of the fluid holding chamber.

5. The device of claim 4 wherein the sensor is selected from the group consisting of optical, electrical, electrochemical, and magnetic sensors.

6. The device of claim 1 wherein the magnetic particles dispersed in the fluid comprise magnetic nanoparticles, paramagnetic ions, or molecular magnets.

7. The device of claim 6 wherein the magnetic nanoparticles comprise iron, iron-oxide, iron-platinum, cobalt, nickel, a rare-earth metal or another alloy forming

ferromagnetic, or a ferrimagnetic or superparamagnetic material, or any combination thereof.

8. The device of claim 6 wherein the magnetic nanoparticles have a surface covered by molecules which provide steric or ionic hinderance in order to prevent irreversible aggregation of the magnetic nanoparticles in the fluid.

9. The device of claim 1 wherein the magnetic sources comprise an array of magnetizable features.

10. The device of claim 9 wherein the magnetizable features are patterned on top of the inner surface of the fluid holding chamber.

11. The device of claim 9 wherein the magnetizable features are embedded inside of the inner surface of the fluid holding chamber.

12. The device of claim 9 wherein the magnetizable features are attached to mobile supports that can be submerged in the fluid.

13. The device of claim 1 wherein the patterns of the magnetizable field sources are changed by applying an additional time-varying source of substantially uniform magnetic field.

14. The device of claim 1 wherein the sources of magnetic fields comprise an array of conductors and a means for switching or varying electrical current in said conductors.

15. A method for mixing on a microscopic scale a fluid containing non-magnetic particles comprising the steps of:

(a) adding magnetic particles to a fluid containing non-magnetic particles to produce a suspension;

(b) placing the suspension obtained in step (a) onto the inner surface of the fluid holding chamber of the device of claim 1; and

(c) modulating the pattern of magnetic field maxima and minima regions of the fields of magnetic sources of the device of claim 1 to induce movement of the magnetic particles in the suspension thereby mixing the non-magnetic particles in the suspension.;

16. A method for perturbing the array of molecules attached to the inner surface of the fluid holding chamber of the device of claim 2 comprising modulating the magnetic field near the sources of the magnetic fields in order to apply force on the molecules attached to the inner surface of the fluid holding chamber.

17. A method for transporting molecules along selected directions of the inner surface of the fluid holding chamber of the device of claim 2 comprising modulating the magnetic field pattern of the magnetic field sources to create regions of traveling magnetic field minima so that the molecules move in the direction of the regions of traveling magnetic field minima.